

2015 Monitoring Summary



Ecological Reference Reach

Beaver Creek at AL Hwy 41 (Monroe County) (31.74144/-87.41965)

BACKGROUND

Beaver Creek is one of the streams the Alabama Department of Environmental Management (ADEM) is monitoring as a candidate for “best attainable condition” reference watershed for comparison with streams throughout the Southern Hilly Gulf Coastal Plain ecoregion (65D).

Additionally, ADEM in consultation with the Environmental Protection Agency (EPA)- Region 4, identified Beaver Creek at BRRM-1 as having insufficient data and information to make a final use support determination for Alabama’s 2014 Integrated Water Quality Report. Refinements to the macroinvertebrate index used to assess the communities were necessary to more accurately characterize the macroinvertebrate communities in ecoregion 65D. Additional biological, chemical, and physical data were collected in 2015 for use in refining the index and fully assessing the use support status of Beaver Creek for the 2016 Integrated Water Quality Report.



Figure 1. Beaver Creek at BRRM-1, May 6, 2015.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Beaver Creek is a *Fish and Wildlife (F&W)* stream that drains approximately seven square miles in Monroe County. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily forest (91%). Population density is low, as is the percentage of developed land (<2%). As of April 1, 2016, no NPDES outfalls were active in the watershed (ADEM NPDES Management System).

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and habitat assessments (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Beaver Creek at BRRM-1 is a medium gradient, mostly shaded stream characterized predominantly by sand, cobble, and gravel substrates. Overall habitat quality and availability was rated as *sub-optimal* for supporting the macroinvertebrate community.

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM’s Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. The final score indicated the biological community at BRRM-1 to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Alabama River	
Drainage Area (mi²)	7	
Ecoregion^a	65D	
Landuse^b		
Open water		
Wetland	Woody	<1%
Forest	Deciduous	54%
	Evergreen	24%
	Mixed	13%
Shrub/scrub		6%
Grassland/herbaceous		1%
Pasture/hay		<1%
Cultivated crops		<1%
Development	Open space	<1%
	Low intensity	<1%
Population/km^{2c}	<1%	

a. Southern Hilly Gulf Coastal Plain

b. 2011 National Land Cover Dataset

c. 2010 US Census

Table 2. Physical characteristics of Beaver Creek at BRRM-1, May 6, 2015.

Physical Characteristics		
Width (ft)	20	
Canopy Cover	Mostly Shaded	
Depth (ft)		
	Riffle	0.3
	Run	1.0
	Pool	2.0
% of Reach		
	Riffle	5
	Run	75
	Pool	20
% Substrate		
	Cobble	15
	Mud/Muck	2
	Gravel	10
	Sand	63
	Silt	5
	Organic Matter	5

Table 3. Results of the habitat assessment conducted on Beaver Creek at BRRM-1, May 6, 2015.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	70	Sub-Optimal (55-79)
Sediment Deposition	65	Sub-Optimal (55-79)
Riffle frequency	55	Sub-Optimal (55-79)
Bank Vegetative Stability	73	Sub-Optimal (58-79)
Riparian Buffer	90	Optimal (>84)
Habitat Assessment Score	144	
% of Maximum Score	76	Sub-Optimal (57-80)

Table 4. Results of the macroinvertebrate bioassessment conducted in Beaver Creek at BRRM-1, May 6, 2015.

Macroinvertebrate Assessment		
	Results	Scores
Taxonomic richness & diversity metrics		
% EPC Taxa	33	60
Taxonomic composition metrics		
% EPT minus Baetidae and Hydropsychidae	27	50
% Dominant Taxon	18	82
Functional composition metrics		
# Collector Taxa	28	100
Tolerance metrics		
% Nutrient Tolerant Individuals	23	73
WMB-I Assessment Score	---	73
WMB-I Assessment Rating		Good (47.5-74.4)

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected monthly, from April through October 2015 to help identify any stressors to the biological community. Conductivity and hardness were higher than expected based on reference reach data for streams in ecoregion 65D. No samples were collected for the analysis of pesticides, semi-volatile organics, or atrazine.

SUMMARY

ADEM monitored Beaver Creek at BRRM-1 in 2015 to determine the suitability of classifying it a “best attainable” condition reference watershed. Additionally, data were collected for use in refining the index and fully assessing the use support status of Beaver Creek for the 2016 Integrated Water Quality Report. Landuse and population density categorize Beaver Creek among the least-disturbed watersheds in the Alabama River basin. Overall habitat quality and availability was rated as *sub-optimal*, and the macroinvertebrate community was found to be in *good* condition. However, conductivity and hardness were elevated as compared to data from ADEM’s least-impaired reference reaches in ecoregion 65D. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected April-October, 2015. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Parameter	N	Min	Max	Med	Avg	SD	Q
Physical							
Temperature (°C)	9	14.8	25.2	18.6	20.2	4.2	
Turbidity (NTU)	9	3.2	14.3	3.8	5.1	3.5	
Total Dissolved Solids (mg/L)	8	57.0	95.0	85.5	79.6	15.0	
Total Suspended Solids (mg/L)	8 <	1.0	13.0	1.0	2.9	4.2	
Specific Conductance (µmhos/cm)	9	65.7	102.4	91.9 ^G	88.6	11.6	
Hardness (mg/L)	8	24.2	38.6	35.5 ^G	33.2	5.1	
Alkalinity (mg/L)	8	10.9	26.7	20.5	20.0	6.1	
Monthly Stream Flow (cfs)	9	0.3	13.3	1.8	3.3	4.2	
Measured Stream Flow (cfs)	9	0.3	13.3	1.8	3.3	4.2	
Chemical							
Dissolved Oxygen (mg/L)	9	7.3	10.5	8.3	8.7	1.2	
pH (SU)	9	6.5	7.2	7.1	7.0	0.2	
^J Ammonia Nitrogen (mg/L)	8 <	0.007	0.031	0.005	0.009	0.009	
^J Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.002	0.043	0.011	0.014	0.014	
^J Total Kjeldahl Nitrogen (mg/L)	8 <	0.064	0.731	0.106	0.244	0.258	
^J Total Nitrogen (mg/L)	8 <	0.046	0.774	0.122	0.258	0.265	
Dis Reactive Phosphorus (mg/L)	8	0.011	0.020	0.016	0.016	0.003	
Total Phosphorus (mg/L)	8	0.024	0.090	0.043	0.049	0.023	
CBOD-5 (mg/L)	8 <	2.0 <	2.0	1.0	1.0	0.0	
COD (mg/L)	8	4.0	23.8	15.9	15.5	6.6	
^J TOC (mg/L)	8	2.5	4.4	3.5	3.4	0.7	
Chlorides (mg/L)	8	3.0	3.6	3.3	3.3	0.2	
Sulfate (mg/L)	5	7.66	18.90	11.30	12.08	4.32	
Total Metals							
^J Aluminum (mg/L)	8 <	0.106	0.514	0.140	0.196	0.167	
Iron (mg/L)	8	0.307	2.120	0.760	0.827	0.566	
^J Manganese (mg/L)	8 <	0.004	0.260	0.018	0.051	0.088	
Dissolved Metals							
^J Aluminum (mg/L)	8 <	0.106	0.164	0.053	0.067	0.039	
Antimony (µg/L)	7 <	0.342 <	0.342	0.171	0.171	0.000	
^J Arsenic (µg/L)	7	0.329	0.825 ^H	0.696	0.592	0.228	7
Cadmium (µg/L)	7 <	0.311 <	0.311	0.156	0.156	0.000	
^J Chromium (µg/L)	7 <	0.347	0.518	0.362	0.360	0.141	
^J Copper (µg/L)	7 <	0.218	0.443	0.309	0.309	0.104	
^J Iron (mg/L)	8	0.178	0.641	0.354	0.392	0.188	
Lead (µg/L)	7 <	0.428 <	0.428	0.214	0.214	0.000	
^J Manganese (mg/L)	8 <	0.004	0.060	0.015	0.018	0.019	
^J Nickel (µg/L)	7 <	0.460	1.502	0.935	0.944	0.462	
Selenium (µg/L)	7 <	0.395 <	0.395	0.198	0.198	0.000	
Silver (µg/L)	7 <	0.365 <	0.365	0.182	0.182	0.000	
Thallium (µg/L)	7 <	0.514 <	0.514	0.257	0.257	0.000	
^J Zinc (µg/L)	7 <	0.522	2.864	1.804	1.510	1.106	
Biological							
^J Chlorophyll a (mg/m ³)	8 <	0.10	2.14	0.50	0.64	0.62	
^J E. coli (MPN/DL)	8	65.7	579.4	95.2	161.8	172.8	

J=estimate; N=# samples; Q=# of uncertain exceedances; G=value higher than median of all verified ecoregional reference reach data collected in ecoregion 65D; H=F&W human health criterion exceeded.

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